THE NATURE OF LIGHT

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Abstract
This paper touches on the subject of whether light really needs a medium, which is termed the luminiferous ether, for its transmission as is in the case of sound which requires a fluid such as air or liquid as the medium for its transmission, and the subject of the velocity of light.
Keywords: medium of transmission; experimental proof; velocity of light

1 Position Of Luminiferous Ether

Einstein in his relativity theory had done away with the luminiferous ether being the medium for the transmission of light. But a number of scientists today are apparently trying to resurrect the role of the luminiferous ether. Is the luminiferous ether indeed necessary for the transmission of light?

Light should not be expected to act the same as sound as they are both intrinsically different. Sound is the result of vibrations in the air (a medium of transmission for sound), vibrations which reach our ear-drums at varying frequencies, i.e., sound is actually moving, vibrating air which affects our ear-drums. Light has been described as a "wave/particle" object - it could be viewed as both a wave and a particle. Does it make sense to expect light too to travel through a medium like sound does? The quantum particle of light is the photon, which is rather similar to the other quantum particles such as the positron, electron, proton and neutron, etc., whereas sound has no quantum particle within it, being just vibrations or physical movements of the air (which affect the sensitive ear-drums). Quantum particles evidently do not need a medium for their functionality. Why should quantum light need a medium such as the luminiferous ether for its transmission?

The Michelson-Morley experiment and others did not find any evidence of this medium, the luminiferous ether. And, apparently from this "null" result of the Michelson-Morley experiment it had been concluded, evidently without much justification, that the velocity of light is invariable, and that nothing could travel faster than the velocity of light, which has apparently just recently been disproved by CERN. Moreover, quantum particles have been found to be capable of teleportation, i.e., transport to another location in space instantaneously, to display "weirdness" (i.e., appear strange and incomprehensible). From all this, it could be concluded that unlike sound, which requires a medium such as air or liquid for its transmission, for light such a medium is not a necessity.

On the other hand, if the luminiferous ether exists (as the medium for the transmission of light), doesn't it have to be composed of atoms, or, quantum particles, as well (the luminiferous ether here appears comparable, e.g., to the carrier signal which carries the picture and sound signals to our TV set all the way from the transmitter at the broadcasting station which could be many miles away)? For those who have been toying with the idea of the luminiferous ether or who are convinced that it exists, how would

they describe this medium, e.g., what they are made of, whether they are comprised of atoms, etc.? [1, 4, 8]

2 Tests

The only way to determine that the luminiferous ether does indeed exist is to physically detect it through experiments, which had evidently so far not been successful, instead of theorisation, and, since the experiments so far had not detected it, it could be concluded that the luminiferous ether does not exist (provided that the experiments had not been faulty). [1, 4, 8]

3 Scrutiny

However, the following important questions should be lavished with some consideration: How is light able to travel very long distances at the very great velocity of 186,000 miles per second in a vacuum? Is some very strong force, a yet unknown, undetected, force, perhaps, a very strong, very high frequency, carrier wave (similar to the above-mentioned carrier signal), which might be interpreted by some as the medium of transmission, carrying light along? Or, is the movement of light entirely self-propagating, i.e., without the aid of any external force? Shouldn't the velocity of light be at, above and below 186,000 miles per second at various points in time, i.e., be variable, as clocks and watches, in fact all mechanisms, natural and artificial, do go faster or slower to varying degrees at various times, which explains why all equipment, including precision equipment, have to be calibrated from time to time in order that accuracy at the accepted level is maintained? [3, 5, 6]

4 Superluminal Motion

A person could be deceived about the time by a not perfect clock, and, the distance by an also not perfect measuring rod. All this implies that time is subjective and not absolute, or, as Einstein had put it, relative, depending on the situation.

There should be a sufficient reason to explain why the clock, and, the brain and bodily functions of the person slow down, and the length of the measuring rod contracts in the direction of motion, on approaching the velocity of light, while at the velocity of light the mechanism of the clock and time are at a standstill and the length of the measuring rod is zero, which is important. Though the intense gravitational field caused by travel at almost the velocity of light might account for the slowing down of the clock (for which experimental evidence had been obtained) and therefore time, as well as the brain and bodily functions of a person, it apparently hardly suffices as an explanation for the contraction of the length of the measuring rod in the direction of travel at almost the velocity of light (for which experimental evidence has yet to be found). Though the constancy of the velocity of light as gauged from the Earth is apparently a well-proven phenomenon, no one has yet been able to travel at almost the velocity of light and gauge the velocity of a light beam by traveling besides it in the same direction though it has been postulated that in this instance the velocity of the light beam would remain the same. Despite the experimental findings that at high velocities, though very much less than the velocity of light, clocks slow down, the contraction of measuring rods in the

direction of motion at almost the velocity of light is apparently only an inference, with no experimental basis.

The following equation describes how the velocity of light (v) is derived:-

$$v = d/t,$$

where d represents the distance traveled by the light beam and t represents the time taken by the light beam to travel the distance d

Since time is relative (and not absolute) and depends on the mechanism of the clock, which slows down on approaching the velocity of light, it could be arbitrary. The clock which is used to gauge the time t taken by the light beam to travel the distance d might not slow down uniformly (at the same rate) on approaching the velocity of light (under normal, earthly conditions time varies from clock to clock by minutes or more - there is apparently some uncertainty in the mechanism of clocks). Besides, the measuring rod used to gauge the distance d traveled by the light beam in time t might not contract in length uniformly (at the same rate) on approaching the velocity of light. If the clock does not slow down uniformly (at the same rate) and the measuring rod does not contract in length uniformly (at the same rate) on approaching the velocity of light there is the probability that the velocity of light (v) as represented by d/t would be variable, higher than 186,000 miles per second at times, below 186,000 miles per second at other times, or, equal to 186,000 miles per second at yet other times. Moreover, in accordance with the Special Theory of Relativity, for the velocity of light to really remain constant, on approaching the velocity of light the clock must slow down to the same degree as the contraction in the length of the measuring rod. We describe these possible outcomes as follows:-

$$\text{(i)}\ \ S^{\%} > C^{\%} \rightarrow I^{l}$$
$$\text{(ii)}\ \ S^{\%} < C^{\%} \rightarrow D^{l}$$
$$\text{(iii)}\ \ S^{\%} = C^{\%} \rightarrow S^{l}$$

where $S^{\%}$ represents percentage of slowing down of the clock, $C^{\%}$ represents percentage of contraction in the length of the measuring rod, I^{l} represents increase in the velocity of light, i.e., exceed 186,000 miles per second, D^{l} represents decrease in the velocity of light, i.e., go below 186,000 miles per second, S^{l} represents velocity of light, i.e., 186,000 miles per second

Since light particles (photons) do not have mass or inertia, which prevents an object possessing it from accelerating beyond the velocity of light, viz., 186,000 miles per second, theoretically there is nothing to prevent light particles (photons) or other objects without mass or inertia from traveling at a velocity greater than 186,000 miles per second.

The following equation shows that no moving object could travel faster than the velocity of light, which is in accordance with the Special Theory of Relativity:-

$$v = \frac{a + b}{1 + ab/c^2}$$

If we let a = velocity of moving train, b = velocity of light beam (which is sent from the back of the moving train to the front of the moving train) with respect to the moving train, which is the moving frame (i.e., the velocity of the light beam (which is sent from the back of the moving train to the front of the moving train) is gauged from the moving train, which is the moving frame), v = velocity of light beam (which is sent from the back of the moving train to the front of the moving train) with respect to the ground level, which is the stationary frame (i.e., the velocity of the light beam (which is sent from the back of the moving train to the front of the moving train) is gauged from the ground level, which is the stationary frame), c = velocity of light = 186,000 miles per second, and, also let $a = b = c$, then:-

$$v = \frac{c + c}{1 + c.c/c^2} = 2c/2 = c! \text{ (And not } 2c!)$$

Though theoretically no object could travel faster than the velocity of light because at the velocity of light the object's mass is infinitely great and therefore it is unable to accelerate, an object without mass, possibly, a quantum particle which is somewhat similar to a photon (a photon is a quantum particle without mass always in motion) might be capable of traveling faster than the velocity of light. Such an object or objects might be waiting to be discovered. As it is, a "theoretical" particle which travels faster than the velocity of light, which is termed "tachyon", has been thought to exist.

There have been a number of speculations pertaining to the variable speed of light (VSL), e.g., one theory states that the velocity of light varies with the various stages of the evolution of the universe, exceeding 186,000 miles per second at certain points of time. [2, 3, 5-7]

5 Conclusion

The importance of the above points about light cannot be denied, in view of the fact that an important tenet of the Special Theory of Relativity, namely that no object could travel faster than the velocity of light, has just recently been contravened, due to the recent discovery of the superluminal motion of neutrinos at CERN. [3, 5, 6]

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